WHAT IS CLAIMED IS:

1. A communications receiver for receiving data transmitted by a transmitter, comprising a time-domain to frequency-domain transformer configured to receive time-domain input data values and produce frequency domain output data values for a plurality of output channels, such that for each input data value said transformer is configured to produce one output data value for each channel.

2. The communications receiver for Claim 1, further comprising a plurality of demodulators, each of said demodulators configured to demodulate frequency domain data for one of said channels.

3. A receiver comprising a time-to-frequency converter, said time-to-frequency converter configured to receive a stream of data samples and calculate *M* streams of output values for *M* communication channels, said converter configured to calculate each of said output values using *N* input values.

4. The receiver of Claim 3, wherein *M* does not equal *N*.

5. The receiver of Claim 3, wherein a new output value is computed for each channel each time said converter receives a new input value.

6. The receiver of Claim 3, wherein the value of *N* is selected on a channel-by-channel basis.

7. The receiver of Claim 3, wherein said receiver is configured to receive communication signals from a power line network.

8. The receiver of Claim 3, wherein said receiver is configured to receive communication signals from a wireless network.

9. The receiver of Claim 3, wherein *N* defines a basis function length.

10. The receiver of Claim 3, further comprising an equalizer configured to equalize a data value for a first channel, said equalizer configured to determine equalization parameters by examining a packet header.

11. A communication transmitter for transmitting data on a plurality of carriers, comprising:

a data separator configured to separate an input data stream into a plurality of channel data streams;

a plurality of channel encoders and a plurality of channel modulators, where each encoder of said plurality of encoders encodes data for a desired channel to produce encoded data for said desired channel, and where each modulator of said plurality of modulators is configured to modulate said encoded data for said desired channel to produce a modulated data stream;

a plurality of basis function generators, each basis function generator configured to generate a set of sample data values corresponding to a basis function for a desired channel according to said modulated data stream for said desired channel, wherein a basis function generated for a first channel is orthogonal to a basis function generated for a second channel under a specified inner product; and

a channel combiner configured to combine said sample data values from one or more channels to produce a transmission stream.

12. The communications transmitter of Claim 11, wherein said basis function generated for said first sub-channel is not orthogonal to a basis function generated for a second sub-channel.

13. The communication transmitter of Claim 11, wherein a bandwidth for a first sub-channel is different from a bandwidth for a second sub-channel.

14. The communication transmitter of Claim 11, where a plurality of sub-channels correspond to a particular frequency bandwidth. In such an instance the sub-channels are said to be in the same sub-band.

15. The communication transmitter of Claim 11, wherein the transmitter is configured to encode data with a programmable symbol time where long symbol times are used when the communication channel is experiencing long delay spreads and noise and shorter symbol times otherwise.

16. The communication transmitter of Claim 11, wherein said transmitter encodes data for a first sub-channel according to a first symbol time, and wherein said transmitter encodes data for a second sub-channel according to a second symbol time, said first symbol time being different from said second symbol time.

17. The communications transmitter of Claim 11, wherein said basis function generator comprises a lookup table.

18. The communications transmitter of Claim 11, wherein said basis function is generated using the CORDIC algorithm.

19. The communication transmitter of Claim 11, wherein said encoded data on said first channel is modulated using PSK.

20. The communication transmitter of Claim 11, wherein said encoded data on said first channel is modulated using DPSK.

21. The communication transmitter of Claim 11, wherein said encoded data on said first channel is modulated using QAM.

22. The communication transmitter of Claim 11, wherein said encoded data on said first channel is modulated using DQAM.

23. The communication transmitter of Claim 11, wherein said encoded data on said first channel is modulated using a first modulation scheme and wherein data on said second channel is modulated using a second modulation scheme, where said first modulation scheme is different from said second modulation scheme.

24. A communication receiver configured to receive data transmitted on a plurality of carriers, comprising:

a sub-band filter for separating a received analog signal into a plurality of separate sub-band signals corresponding to a plurality of sub-bands, where at least one of said sub-bands comprises a plurality of sub-channels, said plurality of sub-channels comprising a first sub-channel and a second sub-channel;

an analog to digital converter configured to convert a first sub-band signal into a first sub-band digital data stream;

a first sliding-window transform configured to transform said first sub-band digital data stream into a first channel data stream;

and a second sliding-window transform configured to transform said first sub-band digital data stream into a second channel data stream.

25. The communication receiver of Claim 24, wherein said receiver is configured to receive communication signals from a power line network.

26. The communication receiver of Claim 24, wherein said receiver is configured to receive communication signals from a radio transmission network.

27. The communication receiver of Claim 24, wherein said receiver is configured to receive communication signals from a wireless network.

28. The communication receiver of Claim 24, wherein said receiver is configured to receive communication signals from a wired network.

29. The communication receiver of Claim 24, wherein said sub-band filter comprises a bandpass filter.

30. The communication receiver of Claim 24, wherein said sub-band filter comprises a surface acoustic wave filter.

31. The communication receiver of Claim 24, wherein an amplitude of at least one of said sub-band signals is adjusted by an automatic gain control.

32. The communication receiver of Claim 24, wherein said first sliding-window transform converts said sub-band digital data stream into at least one frequency-domain digital data stream.

33. The communication receiver of Claim 24, wherein said first sliding window transform uses N time-domain samples from said sub-band digital data stream to generate M frequency domain output values corresponding to M sub-channels.

34. The communication receiver of Claim 33, wherein M is greater than N.

35. The communication receiver of Claim 33, wherein M is less than N.

36. The communication receiver of Claim 33, wherein N is calculated on a sub-band by sub-band basis depending on a carrier-frequency spacing for each sub-band.

37. The communication receiver of Claim 24, wherein said first sliding window transform comprises CORDIC algorithm.

38. The communication receiver of Claim 24, further comprising a demodulator for demodulating said first channel data stream.

39. The communication receiver of Claim 24, further comprising a differential demodulator for demodulating said first channel data stream.

40. The communication receiver of Claim 24, further comprising a synchronizer configured to extract synchronization information from said first channel data stream and provide said synchronization information to a data aligner, said data

aligner configured to bit-align said first channel data stream to produce an aligned data stream.

41. The communication receiver of Claim 40, further comprising at least one equalizer, said at least one equalizer configured to equalize said aligned data stream.

42. The communication receiver of Claim 40, further comprising a channel manager, said channel manager configured to receive equalization information from at least said at least one equalizer, said channel manager configured to provide amplitude equalization information to said automatic gain control.

43. The communication receiver of Claim 40, further comprising a channel manager, said channel manager configured to receive equalization information from at least said at least one equalizer, said channel manager configured to provide phase equalization information to a clock, said clock configured to provide a clock signal to said analog to digital converter.

44. The communication transmitter of Claim 40, wherein said encoded data on said first sub-band is modulated using a first modulation scheme and wherein data on said second sub-band is modulated using a second modulation scheme, where said first modulation scheme is different from said second modulation scheme.

45. The communication receiver of Claim 40, further comprising at least one equalizer, said at least one equalizer configured to equalize said aligned data stream.

46. The communication receiver of Claim 40, further comprising a spreading decoder.

47. A method for differentially demodulating data, comprising:

delaying an input data stream by one symbol period to produce a delayed data stream;

calculating a phase difference between two symbols by multiplying said input data stream by a complex conjugate of said delayed data stream to produce an output stream.

48. The method of Claim 47, further comprising:

computing said input data stream using a sliding window transform; and

introducing a correction factor into said output stream according to said sliding window transform.

49. A method for estimating individual channel attenuation and phase distortion by using differentially detected data from a sliding window transform and redundancy in received data corresponding to a symbol.

50. A method for symbol synchronization in a receiver, comprising:

receiving data having a first symbol time to produce received data;

demodulating said received data using a second symbol time different from said first symbol time to produce a demodulated output; and

correlating said demodulated output with a known symbol sequence and searching for a correlation peak using a bit-based Barker code to provide an adequate correlation peak.